

CLAIMS

What is claimed is:

- 1 1. A method comprising:
2 receiving input optical signals, from an input waveguide on a motherboard,
3 with a photodetector package mounted to a lower surface of a substrate residing
4 above the motherboard;
5 converting the input optical signals to input electrical signals;
6 processing the input electrical signals with a first IC chip mounted to the
7 substrate, thereby forming output electrical signals;
8 converting the output electrical signals to output optical signals via a light-
9 emitting package mounted to the lower surface of the substrate and coupled to an
10 output waveguide to carry the output optical signals; and
11 providing power to the first IC chip, the light-emitting package, and the
12 photodetector package through the motherboard via capacitor DC shunts (CDCSs)
13 arranged between the motherboard and the substrate.
- 1 2. The method of claim 1, further including generating the input optical signals
2 with a second IC chip mounted to the motherboard and optically coupled to the
3 input waveguide.
- 1 3. The method of claim 2, further including coupling the output optical signals
2 to the output waveguide and receiving the output optical signals with a third IC chip
3 mounted to the motherboard and optically coupled to the output waveguide.
- 1 4. The method of claim 1, wherein the converting of the output electrical
2 signals to output optical signals includes amplifying with transimpedance
3 amplifiers.
- 1 5. The method of claim 1, wherein the converting of the input optical signals to
2 input electrical signals includes amplifying with transimpedance amplifiers.

1 6. The method of claim 1, wherein the converting of the input optical signals to
2 input electrical signals includes emitting light from a vertical cavity surface emitting
3 laser (VCSEL) array .

1 7. The method of claim 1, wherein the converting of the input optical signals to
2 input electrical signals includes emitting light from a light-emitting diode (LED)
3 array.

1 8. The method of claim 1, wherein the converting of the input optical signals to
2 input electrical signals includes emitting light from a laser diode array.

1 9. The method of claim 1, wherein the converting of the output electrical
2 signals to output optical signals includes passing light from the light-emitting
3 package through a microlens arrays arranged adjacent the light-emitting package.

1 10. A method comprising:
2 electrically coupling a first IC chip, a light-emitting package, and a
3 photodetector package to respective sets of contact-receiving members of a
4 substrate; and
5 electrically coupling the substrate to a motherboard with capacitor DC
6 shunts (CDCSs) arranged between the motherboard and the substrate, the CDCSs
7 having a capacitance selected to mitigate noise generated by the first IC chip.

1 11. The method of claim 10, further including aligning the light-emitting
2 package and the photodetector package to respective first and second waveguide
3 arrays formed in or on the motherboard.

1 12. The method of claim 11, further including:
2 receiving with the photodetector package input optical signals from the
3 second waveguide array and generating input electrical signals;

4 processing the input electrical signals with the first IC chip and generating
5 output electrical signals; and
6 receiving the output electrical signals with the light-emitting package and
7 generating output optical signals and outputting the output optical signals to the first
8 waveguide array.

1 13. An apparatus comprising:
2 means for receiving input optical signals from an input waveguide on a
3 motherboard, with a photodetector package mounted to a lower surface of a
4 substrate residing above the motherboard;
5 means for converting the input optical signals to input electrical signals;
6 means for processing the input electrical signals with a first IC chip mounted
7 to the substrate, thereby forming output electrical signals;
8 means for converting the output electrical signals to output optical signals
9 via a light-emitting package mounted to the lower surface of the substrate and
10 coupled to an output waveguide to carry the output optical signals; and
11 means for providing power to the first IC chip, the light-emitting package,
12 and the photodetector package through the motherboard, arranged between the
13 motherboard and the substrate.

1 14. The apparatus of claim 13, further including means for generating the input
2 optical signals with a second IC chip mounted to the motherboard and optically
3 coupled to the input waveguide.

1 15. The apparatus of claim 14, including means for coupling the output optical
2 signals to the output waveguide and receiving the output optical signals with a third
3 IC chip mounted to the motherboard and optically coupled to the output waveguide.

1 16. An apparatus comprising:
2 a motherboard;
3 a substrate having contact-receiving members;

4 a first IC chip, a light-emitting package, and a photodetector package each
5 electrically coupled to the contact-receiving members; and
6 capacitive-DC-shunt means for electrically coupling the substrate to the
7 motherboard to mitigate noise generated by the first IC chip.

1 17. The apparatus of claim 16, further including means for aligning the light-
2 emitting package and the photodetector package to respective first and second
3 waveguide arrays formed in or on the motherboard.

1 18. The apparatus of claim 16, further including:
2 means for receiving with the photodetector package input optical signals and
3 generating input electrical signals;
4 means for processing the input electrical signals with the first IC chip and
5 generating output electrical signals; and
6 means for receiving the output electrical signals with the light-emitting
7 package and generating output optical signals and outputting the output optical
8 signals.

1 19 The apparatus of claim 16, wherein the light-emitting package includes an
2 array of light-emitting devices coupled to a first array of transimpedance amplifiers.

1 20. The apparatus of claim 19, wherein the light-emitting array includes one of a
2 vertical cavity surface emitting laser (VCSEL) array, a light-emitting diode (LED)
3 array, or a laser diode array.